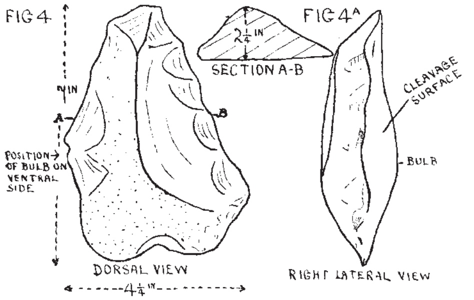
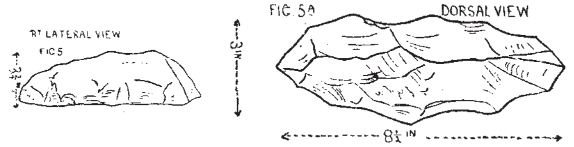
almost entirely of flake-scars, while the keel, or carina, is not a very marked feature.

The implement illustrated in Figs. 4 and 4A is quite comparable, in its general outline and form, with that shown in Figs. 3 and 3A. Both these specimens, made from "chunks" of quartzite struck from still larger masses, are of great interest and importance as showing a transitional stage between the typical rostro-carinate form, with its prominent and functional keel, and the "batiform" Palæolithic implement, in which, while the simple triangular section is retained, the keel has become "depressed" and almost obliterated, thus ceasing to have any functional purpose. I have already described how, by the gradual "depression" of the carina, the rostro-carinate developed into the "batiform" implement of Early Palæolithic times (Phil. Trans., series B, vol. ccix., 1920).



Figs. 4 and 4A.—Massive quartzite implement from Uganda, of a form transitional between the rostro-carinate and the "batiform" Palæolithic specimens.

The specimen illustrated in Figs. 5 and 5A represents another form of the rostro-carinate, in which the keel extends continuously, and approximately, in the middle line, from the anterior to the posterior region of the dorsal surface. I have suggested in my Phil. Trans. paper that such specimens might have been used as "side-choppers," the more or less flat ventral area resting against the palm of the hand, while the prepared keel would be utilised as a cutting edge. It is, of course, possible that, in addition to such use, implements of the type shown in Figs. 5 and 5A might be used as picks. Figs. 6, 6A, and 6B illustrate a specimen of well-known Early Palæolithic type, to which, at the suggestion of Sir Ray Lankester, I have given the descriptive name "platessiform." In this form of implement, in which the keel of the rostro-carinate becomes one of the cutting edges, while the more or less flat ventral surface is flaked away to form another cutting edge opposite to the keel (Phil. Trans., series B, vol. ccix., 1920), the method of manufacture is entirely different from that adopted in the making of a "batiform" implement. In the former the specimen is, as was pointed out by Sir Ray Lankester, so to speak, *compressed* from side to side, and the keel retained as a leading feature in its development, while in the latter the implement is, as it were, *depressed*—from above downwards—and the keel becomes functionless. The specimen illustrated (Figs. 6, 6A, and 6B) is of interest as showing, as do so many Early Chellean implements of similar form found in this country, the retention of portions of the original striking platforms (C and D in Figs. 6A and 6B), the dorsal and ventral surfaces of the ancestral rostro-carinate form.



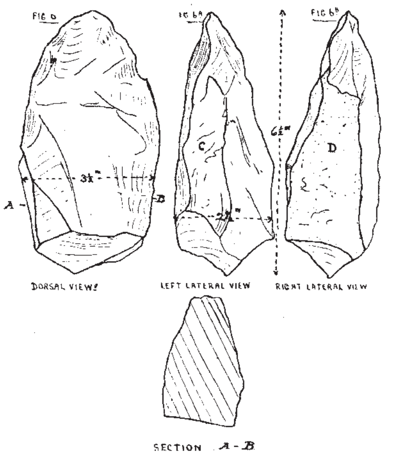
Figs. 5 and 5A.—Quartzite implement of rostro-carinate form from Uganda, in which the keel extends over the whole length of the dorsal surface.

From the above description it will be seen that I am of opinion that the specimens found by Mr. Wayland in Uganda are "related" to the rostro-carinate implements found beneath the Red Crag of East Anglia. It is clear, also, that the method of manufacture adopted in the case of these Uganda specimens is the same as was followed by the Early Chellean people living in this part of the world, and described by me in the Phil. Trans. paper quoted above.

The large collection made by Mr. Wayland in Uganda comprises certain well-made hand-axes, scrapers, and other forms of implements, of which, no doubt, a detailed description will appear in due course. But the majority of the relics found are, it seems, massive examples of Early Palæolithic artefacts, which appear to me to be very similar, in their forms, size, and technique, to those recently found by me at Cromer (Nature, February 10, 1921). Mr. Wayland is to be warmly congratulated upon the important discovery he has made, which throws a new and welcome light upon the antiquity of man in Uganda. The outlines of the implements figured are not drawn to any special scale, but the approximate dimensions are indicated by the side of each drawing.

J. Reid Moir.

One House, Ipswich.



Figs. 6, 6A, and 6B.—Quartzite implement of Early Palæolithic "platessiform" type from Uganda, showing portions of the original striking platforms retained (C and D in Figs. 6A and 6B).

Measuring with High Powers of the Microscope.

Under a high power it is extremely troublesome to move the object so that one of its boundaries coincides exactly with a division of the micrometer-scale. But when the object is small this very greatly increases the accuracy; otherwise two estimated fractions of a division may constitute the greater part of the length measured.

Coincidence may be effected easily and with great exactness by gentle lateral pressure from the tip of the finger on the tube of the microscope; in this way the boundary of a well-defined image can easily be made to bisect a black line on the micrometer. If a

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micrometer with lines 60μ apart be used over a 2-mm. objective with No. 8 eyepiece, each division represents 0·7μ, and a fifth part of a division corresponds to only 1/175,000th of an inch on the slide, which is therefore at the tube's centre the extent of the necessary distortion for bracket and bearing. The original position is recovered completely when pressure is removed. Probably everyone who uses high powers of wide angle has acquired the habit of effecting similarly extremely fine adjustments of focus by pressure on the stage.

With a lower power it is often helpful to press slightly on the nosepiece instead of moving the slide. For quick, rough measurements in the course of other work Prof. Dixon's "ghost micrometer" is very valuable (my friend Dr. W. R. G. Atkins introduced me to it). When the light is taken from a window the image of a piece of wire-gauze leaning against the pane can be brought on the object by a turn of the mirror, and removed again without losing sight of the object.

It may be worth adding that in measuring a distance in the line of sight (thickness) by the scale on the fine adjustment, one notch of the milling on the fine-adjustment head corresponds in my Zeiss to 1/10th of a division, or to 1μ (1·5μ with a dry objective). The notches can be read opposite the pointer through a lens, with a probable total error of 0·4μ for the single measurement of thickness.

In measuring the width or thickness of a calcite spicule the optic axis of which is parallel to the plane of the slide, or in examining an object above or below the spicule, greater accuracy can be obtained by placing on the ocular a Nicol with the plane of polarisation at right angles to the optic axis of the spicule, so that the high refraction of the ordinary ray is abolished. Ebner (*S. B. Ak. Wiss.*, Vienna, vol. xcv., p. 73) recommended to spongologists the use of the single Nicol for determining the direction of the optic axis of spicules.

Interference-colours between Nicols.—The measurement of thickness in these sponge-spicules is very difficult, and I hope to substitute for it the mere reading of the spicule's colour between Nicols. Empirically, the colour of all but the two "limbs" of the cylinder appears to be closely that of a calcite plate of equal thickness, and to be irrespective of the angular aperture of the objective (0·20 to 1·40) and of the presence or absence of an Abbe condenser between the polariser and the object. These are, to me, unexpected results in view of the much longer path in the spicule taken by the ordinary ray as compared with the almost unrefracted extraordinary ray. As it is difficult to exclude a 5 per cent. error from determinations of either the thickness or the retardation, and as it has been disputed whether the carbonate of lime in a spicule be wholly calcite, I shall be very grateful if a physicist will supply the theory of the colour of a cylinder (elliptical or circular) of calcite in Canada balsam. The diameter of the cylinder ranges upwards from a wavelength of light to 10μ or so; the lowest Δ I have determined accurately is $134 \pm 4\mu\mu$ for the middle band of a spicule, which is a right cylinder since its optic axis is parallel to its length, and the width of which is $830 \pm 40\mu\mu$.

GEO. P. BIDDER.

Cambridge, July 10.

Ocean Tides.

IN the letter in NATURE of May 26 (p. 393) under the above heading, by Mr. H. A. Marmer, of the U.S. Coast and Geodetic Survey, it is pointed out that tidal observations would be greatly enhanced in value if permanent bench-marks were established in connection with them, not only for the correlation of any future tidal observations at the same places, but also for the determination of the rate of elevation or subsidence of the land relatively to the sea.

It may be of interest to note that this question was taken up some fifteen years ago by the Academy of Sciences of Paris, when a prize was offered for the best determinations of mean sea-level from tidal observations in any country bordering on the North Atlantic as a basis for such relative change in elevation on its coast-line. This prize was awarded to the present writer as superintendent of the Survey of Tides and Currents in Canada, as it was found that we had already tidal data available for this purpose, because referred to permanent bench-marks, on an extent of eight degrees of latitude from southern Nova Scotia to Belle Isle Strait.

Although this survey was primarily organised in the interests of navigation, its practice of establishing local bench-marks from the outset in 1894 is also bearing fruit in other directions. It has afforded to the Geodetic Survey of Canada, more recently organised, determinations of mean sea-level on both Atlantic and Pacific coasts as a basis ready to hand for extended levelling throughout Canada. Our Geological Survey also refers its contoured maps to mean sea-level, and in several regions it has been possible to give that survey an independent starting-point for these contours from tidal observations already obtained at a locality in the region, as they were referred to a local bench-mark.

As it is not often that the same superintendent remains in charge of a survey for so long as twenty-seven years, it may be allowable to give these examples in our experience of the advantages of the practice recommended by Mr. Marmer, which may accrue years afterwards.

W. BELL DAWSON.

Ottawa, Canada, June 22.

American and British Superannuation Systems.

THE writer of the leading article on this subject in NATURE of June 30 may have misled your readers by the last paragraph but one in his article, because:—

(1) No money can go into the pockets of shareholders of mutual insurance companies; there are no shareholders.

(2) If an endowment assurance is taken under the Federated System the benefits are increased by the share of profits, which, in the case of a mutual company, means a full share of all profits made.

(3) The expenses of the selected insurance companies are probably little more than those necessitated by a separate "association" when we bear in mind that the premiums charged under the Federated System allow for the saving of "commission to agents" by those offices that usually employ agents.

(4) The Federated System obtains the advantage of the experience of insurance companies in investing money expeditiously on a large scale.

The objection quoted as having been made by Mr. Fisher on the second reading of the School Teachers (Superannuation) Bill, 1918, to the effect that public money would go in "dividends to the shareholders" is met by (1) and (2) above. The real difficulty of placing his pension arrangements in the hands of insurance companies is that they cannot assess the invalidity risk or the future salaries on which the pensions in the Bill depend. The invalidity risk, the future salary scale, and the longevity of pensioners have necessitated far heavier contributions to pension funds than had been expected when the funds were started, and the difficulty of keeping private pension funds in a solvent condition is so well known

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